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A Study on the Efficacy of Laboratory Risk Indicator for Necrotizing Fasciitis Score at Tertiary Care Hospital - Puducherry

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Abstract: ***Aim: This study aims to estimate laboratory risk indicator for necrotizing fasciitis score for patients presenting with cellulitis and the effect of this score in predicting the occurrence of Necrotizing fasciitis in them. Methods: In this Prospective study 120 patients with necrotizing fasciitis were included. It is a Hospital based observational study done at Department of General Surgery and Casualty of Sri Venkateshwaraa Medical College and Research Centre (SVMCH&RC). Sampling Technique: Purposive sampling. Duration of the Study: March 2021 to October 2022- (20 months) PARTICIPANT TIMELINE: 2 weeks to 4 weeks. Results: In our study amongst 120 (100%) patients who took part in the study about 87 patients had secured LRINEC score of < 6 out of which 84 (96.6%) people were diagnosed as cellulitis and 3 (3.4%) persons diagnosed as Necrotizing Fasciitis. 13 people secured LRINEC score between 6-8, out of which 11(84.6%) of them were diagnosed as cellulitis and 2 (15.4%) of them diagnosed as Necrotizing Fasciitis. About 20 of them secured a score of >8 and all 20 of them (100%) were found to be diagnosed with Necrotizing Fasciitis. Conclusion: In Our study the sensitivity of the LRINEC score was 88%, specificity - 88.42%, positive predictive value - 66.66%, negative predictive value - 96.55% and accuracy - 88.33%. To conclude, LRINEC score has shown a better Negative predictive value in identifying the onset of Necrotizing Fasciitis and risk strategization of the patients with severe soft tissue infections. Hence can be used as a reliable laboratory risk indicator for Necrotizing Fasciitis patients with cellulitis along with clinical examination.***

Keywords: Necrotizing Fasciitis (NF), laboratory risk indicator for necrotizing fasciitis, diagnostics tool, cellulitis

1. Introduction

The term Necrotizing fasciitis (NF) describes a group of relatively uncommon, but life-threatening infections of the skin, soft tissues, and muscles, which tend to progress rapidly through the fascial planes, causing gradual destruction of the fascia at a rate reaching 2–3 cm/h. Developing in the lower or upper extremities, the perineum and genital area (Fournier's gangrene) and in the abdominal wall, the swift clinical course of the condition is correlated with polymicrobial infection and synergy, which usually co-exists (1, 2). The majority of cases present anaerobic bacteria that proliferate in a hypoxic environment and produce gas, which accumulates in the soft tissue spaces, giving the characteristic image of gas gangrene on plain X-rays and computed tomography (CT) scans (3).

Early diagnosis of NF is mandatory. Any delay could prove fatal, given its association with more extensive surgery, higher rates of amputation, and higher morbitiy/ mortality rates. Furthermore, if left untreated, the infection could lead to Systemic inflammatory response syndrome (SIRS) / Acute respiratory distress syndrome (ARDS) /Multi organ dysfunction syndrome (MODS)

Diagnosis of NF is made by physical examination, but may be difficult since it is frequently confused with the other skin and soft tissue infections. For this reason, the scoring system called Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC) was developed in 2004 by Wong and colleagues, and was shown to be helpful for distinguishing NF from other soft tissue infections.[10] It was reported in further studies that this scoring system can be used for early diagnosis of NF. To calculate the LRINEC score, C-reactive protein, hemoglobin, blood leukocyte count, serum glucose, serum creatinine, and serum sodium values of patients were measured at admission and scored. Then a certain score value is obtained for each patient. Values of six or higher indicate the most likely diagnosis of NF. Multiple studies have assessed the utility of LRINEC score for the early diagnosis of NF and found that it can be used for identification and classification of NF patients into different risk categories that subsequently facilitates the appropriate management of hospital resources. However, only a few studies have observed an association between LRINEC scoring values and outcomes in patients with NF. There is always a need to find a simplified bedside, validated, rapid tool for early stratification of patients with a potential life-threatening illness. Hence this present study aims to estimate laboratory risk indicator for necrotizing fasciitis score for patients presenting with cellulitis and the effect of this score in predicting the occurrence of Necrotizing fasciitis in them.

2. Materials and Methods

In this Prospective study 120 patients with necrotising fasciitis were included. It is a Hospital based observational study done at Department of General Surgery and Casualty of Sri Venkateshwaraa Medical College and Research Centre (SVMCH&RC).

Sampling Technique: Purposive sampling. DURATION OF THE STUDY: March 2021 to October 2022- (20 months)

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Participant Timeline: 2 weeks to 4 weeks.

Inclusion Criteria
Patients of Age >19yrs diagnosed to have Cellulitis were included in the study. Both male and female patients were included in the study. Diabetic and Non – Diabetic patients were included in the study.

Exclusion Criteria
Those who were diagnosed with Peripheral vascular disease, IHD and CVA. Those who underwent wound debridement outside our hospital were excluded from the study. Diabetic patients with Diabetic Nephropathy were excluded from the study.

3. Methodology

All patients included in the study were explained about the study and their participation and written consent was obtained. All patients presenting with cellulitis to the department of General surgery and Casualty were included in the study. A detailed history including name, age, sex, occupation, co morbid conditions, treatment undergone elsewhere were obtained. Blood investigations required to calculate LRINEC includes the routine basic blood investigation plus serum C-reactive protein which would be collected by drawing 1ml blood sample from cubital vein under sterile precautions in a red topped serum gel tube. The Blood samples were collected by Staff nurse only once. The blood investigations required to calculate the score are as follows:

Components of Laboratory Risk Indicators of Necrotizing Fasciitis score:
Total white cell count – 1.5 ml,EDTA lavender color topped tube
Blood Hemoglobin – 2 ml, EDTA lavender color topped tube
Serum Sodium – 2 ml, Red/Yellow color topped
Serum Potassium – 2 ml, Red/Yellow color topped
Random Blood Glucose – 2 ml,Grey color topped
Serum creatinine – 2 ml, Red/Yellow color topped
C-reactive protein – 1 ml, red topped serum gel tube.

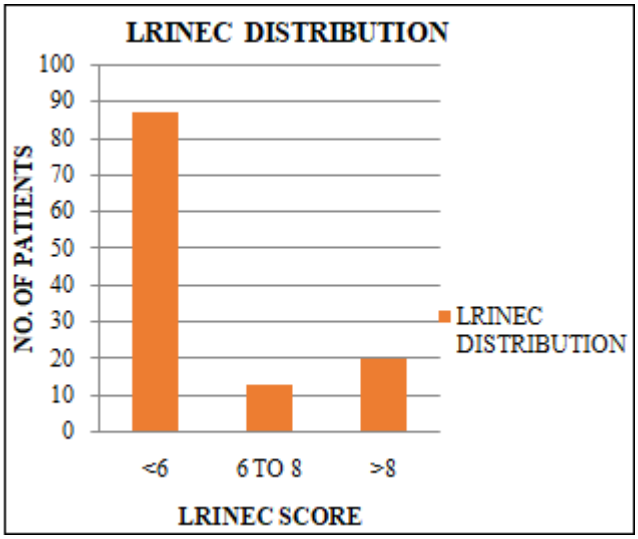
The LRINEC score is a robust score capable of detecting even clinically early cases of necrotizing fasciitis. The variables used were routinely measured to assess severe soft tissue infections. Patients with a LRINEC score of >6 were carefully evaluated for the presence of necrotizing fasciitis
The maximum score is 13;
A score of >/6 should raise the suspicion of necrotizing fasciitis.
A score of >/8 is strongly predictive of this disease.

Statistical Analysis
The data during the study was collected and tabulated. The data thus obtained was analyzed by statistical package for social service 23.0 (SPSS). Descriptive statistics was obtained for quantitative variables like Age, Vitals, total counts, serum sodium, blood glucose, serum creatinins, C - reactive proteins Categorical variables like sex, diagnosis, co morbid illness, past medical history was expressed in frequency and proportion. P value of < 0.05 was considered statistically significant. Sensitivity and specificity of LRINEC score was calculated. Positive predictive value and negative value was calculated.

4. Results

LRINEC Distribution

LRINEC	Frequency	Percent
Less than 6	87	72.5%
6 to 8	13	10.8%
More than 8	20	16.6%
Total	120	100



Amongst 120 (100%) cases who took part in the study, LRINEC distribution was determined, where 87 (72.5%) cases had a score of less than 6 frequencies of LRINEC distribution , about 13 (10.8%) cases had a score between 6 to 8 frequencies of LRINEC distribution, and 20 (16.6%) cases had scores more than 8 frequencies of LRINEC distribution.

5. Discussion

Necrotizing fasciitis (NF) is a rare but deadly soft tissue necrosis with a high morbidity and mortality rate that often affects fascia and subcutaneous tissues. According to estimates, 13 per million people are hospitalised each year for NF, with a death rate of 20–30% (13).

Without an accurate and prompt diagnosis and treatment, the mortality rate could increase to 100%. Diabetes mellitus (DM), immune disorders, illegal drug use, and malnutrition are the main risk factors for NF. This type of infection can develop from a small wound or frequently happens without any apparent cause.

To achieve positive results in NF patients, early diagnosis, aggressive repeated debridement, broad-spectrum antibiotics, and a multidisciplinary critical care approach are essential. Initially designed to identify NF from other severe soft tissue infections, the Laboratory Risk Indicator for NF (LRINEC) is a rating system based on six routinely conducted laboratory tests. It has been determined by numerous studies that LRINEC is valuable for the early detection of NF and that it may be used to identify and categorise soft tissue infection patients into different groups, making it easier to identify the

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severity of infections and treat them accordingly. However not much studies have been done about the effectiveness of LRINEC score and its outcomes which is the reason for us to conduct this study. We assessed the effectiveness of this scoring system by comparing multiple parameters and variables which would usually affect the outcome of the patients with soft tissue infection, with other similar studies.

Amongst 120 (100%) cases who took part in our study, the sensitivity of LRINEC score was 88%, specificity was 88.42%. The score had a Positive Predictive value (PPV) of 66.66%, Negative Predictive Value (NPV) of 96.55% and Accuracy of 88.33% was determined.

Thomas Borschitz et al., (15) in his study reported the positive predictive value (PPV) for cases with 'strong suspicion' was improved from 0.76 to 0.8, together with an improvement of the negative predictive value (NPV) from 0.77 to 0.91.

In terms of diagnostic efficacy, the LRINEC proved to be unreliable in Vanessa Hoesl et al., [14] study due to lack of sensitivity, a high rate of false–negative results, and a low positive predictive value.

But in our study amongst 120 (100%) patients who took part, about 87 patients had secured LRINEC score of < 6 out of which 84 (96.6%) people were diagnosed as cellulitis and 3 (3.4%) persons diagnosed as NF. 13 people secured LRINEC score between 6-8, out of which 11(84.6%) of them were diagnosed as cellulitis and 2 (15.4%) of them diagnosed as NF.

About 20 of them secured a score of >8 and all of them (100%) were found to be diagnosed with NF. The patients with a score <6, of which majority of them were diagnosed with cellulitis were managed conservatively preventing the patients from further progression into necrotizing fasciitis. Patients who scored between 6-8, of which majority of them were diagnosed with NF were treated cautiously with higher antibiotics, surgical debridements, fasciotomy and intensive care support preventing them from septicemia. Patients who had scores of >8 were vigourously treated with fasciotomy, higher antibiotics, intensive care, surgical debridements with or without amputations at required level in order to prevent the patient from life threatening SEPSIS and its complications such as SIRS/MODS/ARDS. Thus LRINEC score helps in early identification of Necrotizing Fascitiis and aggressive treatment for the same.

However In observance with a high NPV (96.55%) in our study we would like to convey that LRINEC score should only be used as an adjuvant with simultaneous consideration of all clinical parameters. Furthermore, as previously shown in other studies, we identified the initial LRINEC value at diagnosis as an independent prognostic marker, the level of which correlated significantly with patient outcome.

To predict mortality, we had set a cut-off value of 8 LRINEC points. It was in regard for treating physicians, this means that, in conjunction with a corresponding clinical expression, patients with a high LRINEC (≥8) must be promptly treated with higher antibiotics, Intensive care, debridements and amputations at appropriate levels. Surgical debridement must be initiated as soon as possible to prevent a lethal course. Furthermore, our study showed that the course of LRINEC is not influenced by any of the investigated parameters and no conclusions on the clinical course can be drawn based on the LRINEC change later during the course of the disease. However, before definitive statements can be made regarding the suitability of LRINEC as a progression parameter and to substantiate the present data, the score needs to be prospectively tested in a large collective.

6. Conclusion

Our study had the sensitivity of the LRINEC score as 88%, specificity is 88.42%, positive predictive value is 66.66%, negative predictive value is 96.55% and accuracy is 88.33 %.

To conclude, LRINEC score has shown a better Negative predictive value in identifying the onset of NF and risk strategization of the patients with severe soft tissue infections and hence can be used as a reliable laboratory risk indicator for NF patients with cellulitis along with clinical examination.

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